Swannanoa Tunnel, 1877
Southeast of Ridgecrest
Buncombe County
North Carolina

HAER NC-12

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
Heritage Conservation and Recreation Service
Department of the Interior
Washington, D. C. 20243

HISTORIC AMERICAN ENGINEERING RECORD

Swannanoa Tunnel

NC-12

Location:	Southeast of Ridgecrest, 300 yards north of US 70, Buncombe County, North Carolina UTM: 17.385000.3942700 17.383480.3942420 Quad: Black Mountain
Date of Construction:	1877-1879; extensively altered 1963
Original Owner:	Western North Carolina Railroad
Present Owner:	Southern Railway
Significance:	Longest tunnel on Western North Carolina Railroad; significant early use of nitroglycerine; major utilization of convict labor.
Current Condition:	In use. Structure bears no resemblance to the original tunnel due to extensive reworking, most recently in 1963.
Historian:	Patrick W. O'Bannon, 1977.

Organized in 1855, the Western North Carolina Railroad sought to link Asheville, in the isolated western portion of the state, with Salisbury, which was a terminus of the North Carolina Railroad. Rails were pushed three miles east of Morganton before the Civil War brought a halt to all construction and repair work, and threatened the company with bankruptcy. [1] During the War the railroad suffered $111,000 worth of damage. Ditches filled in; rails warpped out of alignment; and ties rotted for lack or replacement.

After the War the company pushed its rails forward another 36 miles to Old Fort, on the eastern edge of the Mountain Division. It reached this point by the end of 1869. The next ten miles into the mountains contained a series of formidible engineering problems, including the construction of the 1,832-foot-long Swannanoa Tunnel. [2]

The Mountain Division required nearly ten miles of track to ascend only 3.4 miles into the mountains. [3] The track curved a total of 2,776°, the equivalent of nearly eight complete circles. In climbing 1,092 feet, the track managed to maintain a maximum grade of 5% by passing through six tunnels: the 123-foot-long Jarrett's; the 589-foot Lick Log; the 77-foot McElroy; the 494-foot High Ridge; the 252-foot Burgin; and the Swannanoa. [4]

The Swannanoa Tunnel presented the builders of the Western North Carolina Railroad with their last major obstacle before the tracks could descend the mountains to Asheville. As such, its history is essential to the story of the linking of western North Carolina with the rest of the state. The actual mechanics of the tunnel's construction appear to have been representative of the period's railroad technology.

The Hoosac Tunnel in Massachusetts represented the epitome of American tunnel construction in the 1870s. The Swannanoa seems to have followed the guidelines set by the northern experience. A heading was driven in advance of the rest of the face with the aid of explosives and shored with timber. Removal of the bench trailed the heading's advance by some 25 to 30 feet. Carts were used to haul the debris from the shaft. [5]

The Swannanoa, however, also exhibited a number of idiosyncracies which make it stand apart from other tunnels of the period. Almost all of the work on the tunnel was performed by convict laborers leased from the state, a labor procurement practice widely used throughout the South after the Civil War. The tunnel also represented an early use of nitroglycerine. This explosive, first used in the United States during work on the Hoosac Tunnel in 1866, was still rare during the 1870s because of its highly volatile nature. [6]

D. C. Salsbury received a contract for the work on the Swannanoa in 1868. For ten months his 45 man crew labored night and day on the first 650 feet of the shaft. Salsbury received six dollars a cubic yard, five dollars in cash and one dollar in railroad stock, for the first 900 feet excavated. For the remainder of the work the contract stipulated an increase in the rate of one dollar a cubic yard. [7]

In January 1869 a bond scandal slowed work to a near standstill. George W. Swepson, a respected North Carolinian, and Milton S. Littlefield, a carpetbagger from Maine, absconded with $4,000,000 in railroad bonds, leaving the road financially paralyzed. Work on the line halted in 1872, when the company's finances were exhausted. For four years the road moldered. Mud slides filled cuts and caved in tunnels, while rain and vegetation obliterated the roadbed. [8]

In an effort to assure the line's completion, the state moved in and, on 22 June 1875, purchased the road for $825,000. An annual appropriation of $70,000 was to fund the purchase of rails and other track material. Construction resumed under state supervision on 1 October 1875, and it quickly became apparent that $70,000 was totally insufficient for the amount of material required. The rails for the three miles of track laid beyond Old Fort in 1876 were provided on credit by a group of concerned citizens in Wilmington. [9]

L. S. Aldrich received a contract early in 1876 for the work on the western approaches to the Swannanoa. Work commenced in May, with a crew of convicts supplied by the state. Aldrich received up to 40¢ a cubic yard for this grading work. [10]

On 1 February 1876 Major James W. Wilson [11] received the contract for the excavation of the Swannanoa. The state agreed to pay Wilson two dollars per cubic yard for the driving of the solid rock tunnel. Wilson was advanced $2,000 for the work, and received $600 a month in cash, provided 300 yards were removed each month. The state also agreed to provide Wilson with convict laborers and their guards. [12]

Following the state takeover of the line, convict labor became almost the sole form of labor on the railroad. Free workers were rare in the area, and were only used in a few key supervisory and specialist roles. The contractors leased the convicts from the state, which also provided guards, overseers, and support facilities. Most of the prisoners were black, about 25 years of age. Their average sentence was for four years. [13]

During the first year of state operation, 315 convicts performed 52,030 days of construction work valued at $51,055, or 98.17¢ per day

per convict. Supporting the prisoners cost only 30¢ a day: 7¢ for food, 10¢ for guards, and the remainder for clothing, medical attention, and miscellaneous expenses. Since free labor would have cost an average of $1 a day plus the cost of support, the savings were substantial for the railroad and the contractor. [14]

Female convicts did the washing, mending, and cooking for their male counterparts. Bacon, beef, corn bread, peas, potatoes, and onions made up the diet. The daily ration consisted of a half pound of bacon, 22 ounces of meal, a third-pound of peas or a pound of potatoes, and coffee. Four pounds of rye were added to each pound of coffee. All supplies were purchased locally. [15]

Five convict camps, under the supervision of Henry M. Miller, and later Major Roger P. Atkinson, were established along the mountain division. The 138 workers laboring on the Swannanoa lived in a camp known as Top. Life in these camps was harsh; many of the men suffered from a lack of clothing and shoes. Within the tunnel as many as ten convicts labored to push and pull heavy carts loaded with rubble from the shaft. Man-power was resorted to whenever animals were in short supply.

Atkinson reported that of the 983 convicts employed on the road in 1879, 216 were discharged; 12 pardoned; 2 killed by their fellow inmates; 7 shot to "prevent escape;" 4 killed by accident; 43 died; and 34 escaped. An average of 511 convicts worked the line each day, while another 64 were on the sick list. [17]

The main complaint that contractors had with their labor force was that it did not work to its full potential. Contractors blamed the dual control exercised by the state and themselves as the reason for the workers' poor performance, which they rated as being only 60% of what could be expected. Guards doubled as overseers and were unable to properly direct the work. The contractors claimed that if they were given sole control of the prisoners, the work would proceed more rapidly and efficiently. [18]

After watching 18 months of dismal progress on the state-owned railroad, the General Assembly decided on 10 February 1877 to re-create the company as a public corporation. Stock was issued in the amount of $850,000 and a 12-man board of directors was chosen, with James W. Wilson named president and chief engineer. Colonel Thaddeus Coleman served as assistant engineer and directly superintended the tunnel work. The state retained a large amount of control over the company, and its exact nature, whether public corporation or state-owned enterprise, lay in doubt until 29 March 1880, when William J.

Best and associates bought out the state's interests in the line. [19]

Work continued on the ten miles of the Mountain Division throughout 1877 and 1878. By the end of 1878 the rails had reached the eastern portal of the Swannanoa, and the crews prepared for the final push through the tunnel. [20]

Explosives were the workers' primary tool against the rock. Both black powder and nitroglycerine were used, with the latter proving very effective. Some 18,000 pounds of nitroglycerine were manufactured for use on the division. The factory was a hut on the west bank of the French Broad River, opposite the mouth of Reem's Creek. The nitroglycerine cost 50¢ a pound to manufacture, while the cost of hauling in the dangerous liquid would have been a high as 90¢ a pound. [21]

Jugs of the explosive were transported to the various construction sites in one-horse carts driven by convict. At the site sawdust and cornmeal were mixed with the liquid to form a paste. This mixture was tapped into the drill holes and fired electrically. These holes were driven according to the common practice of the time. Steel bits were hammered into the heading a distance of 20 inches. These holes were arranged so as to form a "vee" with their inner ends nearly meeting. Up to a pound of powder was tamped into each 1-1/2 inch diameter drill hole. After the explosion convicts removed the debris in wheelbarrows while teams of horses and oxen hauled off the larger boulders. [22]

Inclement weather plagued the workers. Heavy rains often slowed the work to a virtual standstill. At one point, with all but 8,000 yards removed from the 77,000 cubic yard, 450-foot-long Mud Cut, a slide deposited 110,000 yards of material in the cut. All this material had to be laboriously removed by hand. [23]

In an effort to speed the work on the Swannanoa, crews began working two 10-hour shifts each day. Wilson decided to put drews to work on the western face of the tunnel to further speed its progress, but to do this a locomotive had to be gotten to the west side in order to support the crews. The locomotive "Salisbury" was lashed to wooden skids and, by a combination of brute strength and blocks and tackles, dragged over a wagon road to the western portal. [24]

By 13 February 1879 only 55 feet of heading and 500 feet of bench remained in the tunnell. [25] On 11 March 1879 Wilson wired Governor Zebulon B. Vance, "Daylight entered Buncombe County today through the Swannanoa Tunnel. Grades and centers met exactly." [26]

This laconic telegram merely heralded the begining of more work, for the bench remained to be cleared. Three shifts were employed in this work, but the necessity of ballasting every foot of the tunnel as it was cleared greatly slowed the progress. [27] Rains also slowed the work, and not until 18 December 1879 did a train pass through the tunnel. The remaining distance to Asheville presented no major engineering problems, and the tracks reached that city on 2 October 1880, finally linking western and eastern North Carolina. [28]

The Swannanoa Tunnel represented the last major obstacle delaying the joining of the two sections of the state. Its construction had cost $2,000,000 and the lives of 125 convict laborers, who were buried in the fills along the tracks. As a socially unifying agent the tunnel was of obvious importance to North Carolina. Its technical history is less dramatic, but seems representative of the technology of the times. The use of nitroglycerine, and the employment of convict laborers distinguish the tunnel from many of its contemporaries. [29]

At present the Swannanoa Tunnel bears no resemblance to the original work, except in the fact that it occupies the same location. Over the years the tunnel has been enlarged several times to accomodate newer and larger locomotives. In 1963 the entire structure was reworked. New, concrete portals were added, and the interior was enlarged. None of the original work remains evident.

NOTES

[1]Cecil Kenneth Brown, A State Movement in Railroad Development (Chapel Hill: University of North Carolina Press, 1928), p. 188.

[2]Brown, p. 210.

[3]Raleigh News and Observer, 18 May 1940, p. 11.

[4]Asheville Citizen-Times, 29 January 1969, p. 14; Raleigh News and Observer, 28 September 1930, p. 1.

[5]Gosta E. Sandstrom, The History of Tunneling (London: Barrie and Rockliff, 1963), p. 283; Walter Loring Webb, Railroad Construction: Theory and Practice (New York: John Wiley & Sons, 1906), p. 189.

[6]Sandstrom, p. 283.

[7]Report of the Joint Select Committee on the Western North Carolina Railroad, Document 30, Session 1876-1877, Raleigh, p. 30.

[8]Raleigh News and Observer, 18 May 1940, p. 11; Asheville Citizen-Times, 26 January 1929, p. 14.

[9]Brown, pp. 223-224.

[10]Joint Select Committee Report, p. 37.

[11]Wilson, a native of Granville County, was a partner in the firm of John Malone & Company, which held the original contract for the Mountain Division issued in 1868. He had previously served as a rodman on the initial surveys for the road. During his tenure as chief engineer he also served as a state assemblyman from Burke County. He owned all of the land between Round Knob and Ridgecrest across which the tracks ran. His sawmill, run with convict labor, provided some of the timber for the line during his time as president of the road. In the late 1870s he simultaneously held the offices of chief engineer and president of the road, contractor for the Swannanoa Tunnel, local landowner, and state assemblyman. In spite of his jumbled interests his conduct seems to have been exemplary, and no scandal ever reached his office; John Gilbert and Grady Jefferys, Crossties Through Carolina (Raleigh: The Helios Press, 1969), p. 25; Joint Select Committee Report, p. 2.

[12]Joint Select Committee Report, p. 43.

[13]Report of the Committee of Investigation on the Western North Carolina Railroad and the Western Insane Asylum, Document 27, Session 1879, Raleigh, p. 25; Second Annual Report of the Commissioner of Labor; 1886; Convict Labor (Washington: Government Printing Office, 1887), p. 273.

[14]Brown, p. 224; Commissioner of Labor Report, p. 206.

[15]Joint Select Committee Report, p. 36; Committee of Investigation Report, p. 30.

[16]Committee of Investigation Report, p. 6; Ibid., pp. 5, 39.

[17]Ibid., p. 6.

[18]Joint Select Committee Report, pp. 31, 32, 37.

[19]Ora Blackmun, Western North Carolina (Boone, North Carolina: Appalachian Consortium Press, 1977), p. 392; Raleigh News and Observer, 28 September 1930, p. 1.

[20]Railway Age, 4 (23 January 1879): 38.

[21]Committee of Investigation Report, p. 13; Foster A. Sondley, A History of Buncombe County, North Carolina (Asheville: The Advocate Printing Company, 1930), p. 630.

[22]Sondley, p. 630; Blackmun, p. 394; Sandstrom, p. 282.

[23]Blackmun, p. 393.

[24]Joint Select Committee Report, p. 43; Raleigh News and Observer, 18 May 1940, p. 11.

[25]Committee of Investigation Report, p. 11.

[26]The Carolina Watchman, 13 March 1879, p. 3.

[27]Ibid., 23 October 1879, p. 3.

[28]The Carolina Watchman, 25 December 1879, p. 3; Raleigh News and Observer, 28 September 1930, p. 1.

[29]Raleigh News and Observer, 18 May 1940, p. 11.

BIBLIOGRAPHY

Asheville Citizen-Times 26 January 1929; 29 January 1969.

Two good, brief histories of the road, with the emphasis on the Mountain Division.

Blackmun, Ora. Western North Carolina. Boone, North Carolina: Appalachian Consortium Press, 1977.

A regional history with four pages on the railroad, including an interesting map.

Brown, Cecil Kenneth. A State Movement in Railroad Development. Chapel Hill: University of North Carolina Press, 1928.

A scholarly examination of the development of the railroad which concentrates on the financial problems encountered. Makes good use of original sources and is profusely footnoted.

The Carolina Watchman 16 January 1879 - 25 December 1879.

The only contemporary newspaper accounts of the construction of the road discovered. Some interesting facts are brought out in these articles.

Gilbert, John and Jefferys, Grady. Crossties Through Carolina. Raleigh: The Helios Press, 1969.

A well written little book on the state's railroads with a fair amount on the WNCRR. A number of good illustrations.

Railway Age 4 (23 January 1879): 38.

A notation on the mileage attained in 1878.

Raleigh News and Observer. 28 September 1930; 18 May 1940.

Two histories of the road, the latter drawing heavily on the first, which are quite excellent.

Report of the Committee of Investigation on the Western North Carolina Railroad and the Western Insane Asylum. Document 27, Session 1879.

An invaluable document with a great deal of information on the use of convict laborers.

Report of the Joint Select Committee on the Western North Carolina Railroad. Document 30, Session 1876-1879.

Another valuable document, with more information on convict leasing, and some information on the prices awarded to the contractors.

Sandley, Foster A. A History of Buncombe County North Carolina. Asheville: The Advocate Printing Company, 1930.

A county history with a fascinating paragraph on the use of nitroglycerine in railroad construction.

Sandstrom, Gosta E. The History of Tunneling. London: Barrie & Rockliff, 1963.

A history of the art of tunneling consulted to acquaint the author with the details of the technology. An interesting chapter on the construction of the Hoosac Tunnel, and another on the use of explosives.

Webb, Walter Loring. Railroad Construction: Theory and Practice. New York: John Wiley & Sons, 1906.

A manual for engineers, with some worthwhile information on the construction of tunnels, not as detailed as Sandstrom.